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Cullen

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(54) **INSULATING WALL ASSEMBLY WITH FRAMING MEMBER SUPPORTS PARTIALLY EMBEDDED WITHIN RIGID INSULATION PANELS**

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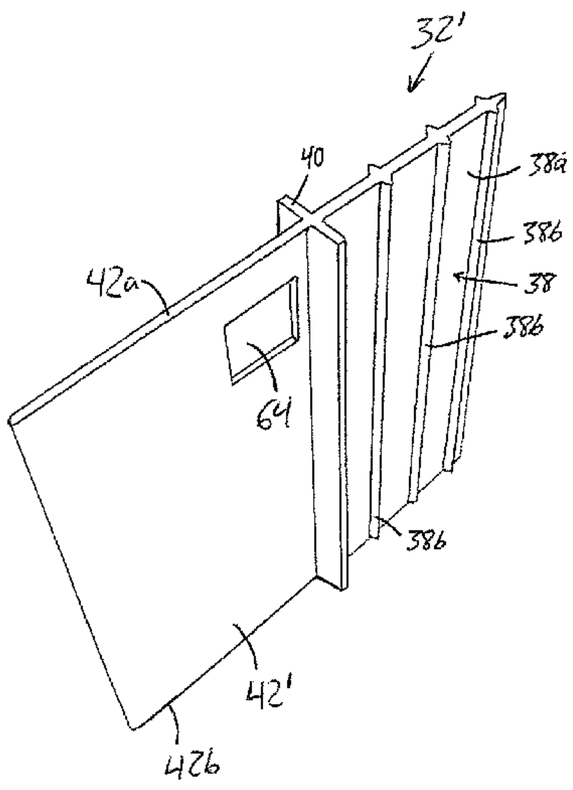
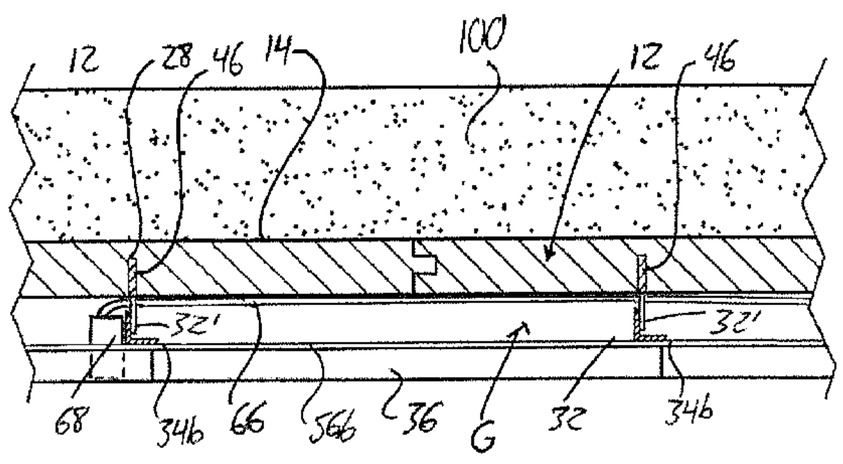
(57) **ABSTRACT**

An insulating wall assembly features a plurality of insulation panels fitted together end-to-end and each having least one slot in a side thereof facing into an interior space of a building. At each slot, a respective set of supports each have an insertion portion engaged in the slot and a fastening portion reaching outwardly from said slot past the first face of the insulation panel. A respective framing member is fastened to each set of supports with a longitudinal dimension of said framing member running along the slot in which said set of supports are engaged. Each framing member has a first leg fastened face-to-face with the fastening portions of the respective set of supports and a second leg facing away from the insulation panels to present a surface for fastening of wall-finishing panels thereto. Holes in the supports accommodate electrical wiring or other lines within the finished wall assembly.

20 Claims, 6 Drawing Sheets





(51) **Int. Cl.**

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E04C 2/00	(2006.01)
E04C 2/284	(2006.01)
E04F 13/08	(2006.01)
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USPC 52/483.1, 489.1, 489.2
See application file for complete search history.

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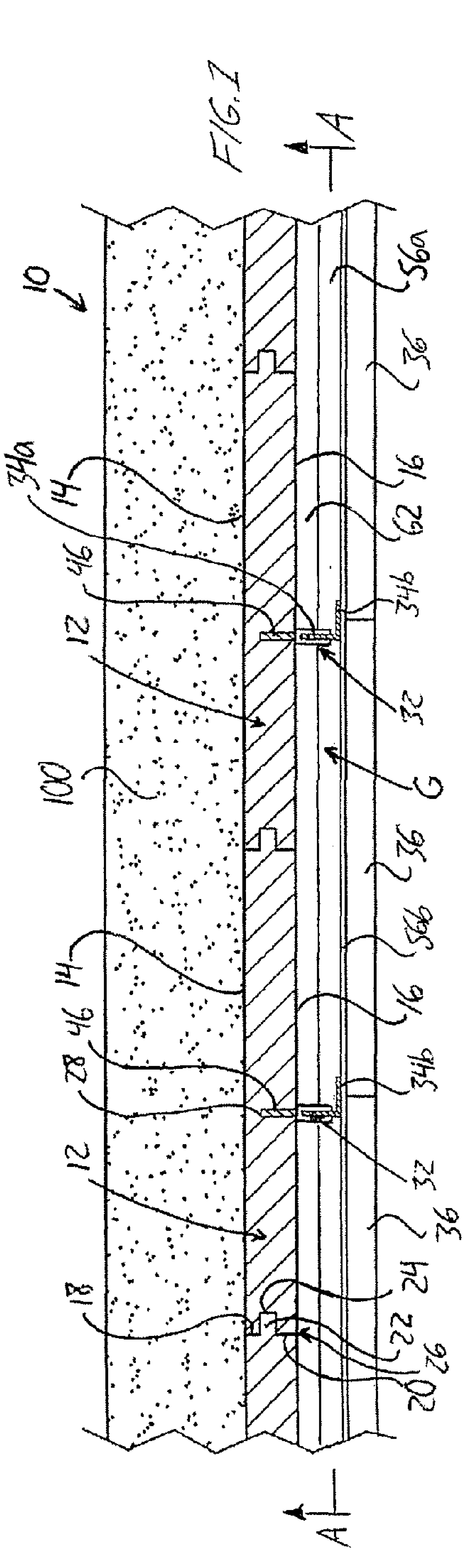
FIG. 1
A
10
34a
14
46
12
100
28
18
22
20
26
24
32
G
36
56a
56b
16
62
34b
A

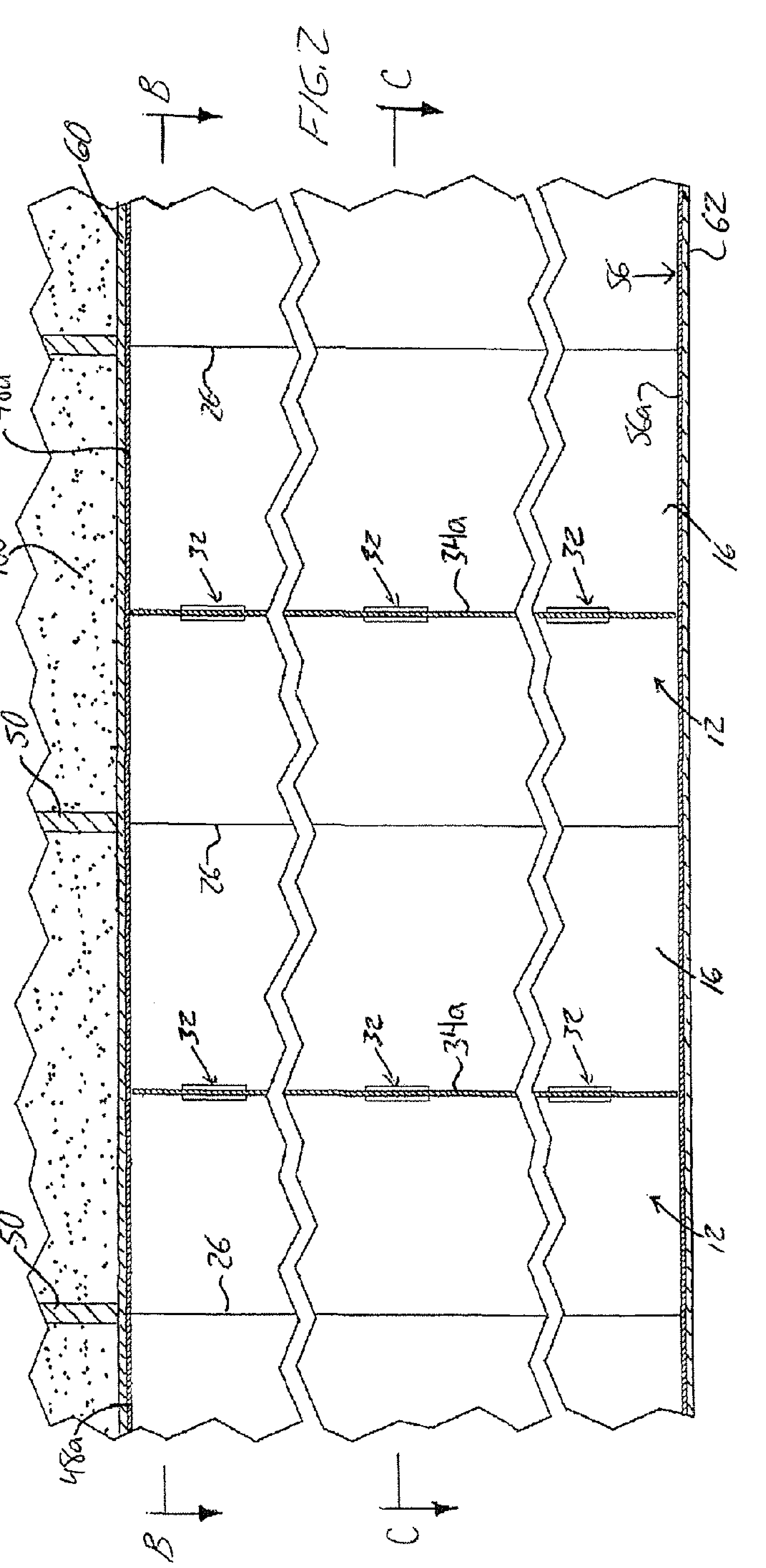
FIG. 2
B
C
60
48a
100
50
26
32
34a
56
56a
16
12
62
B
C

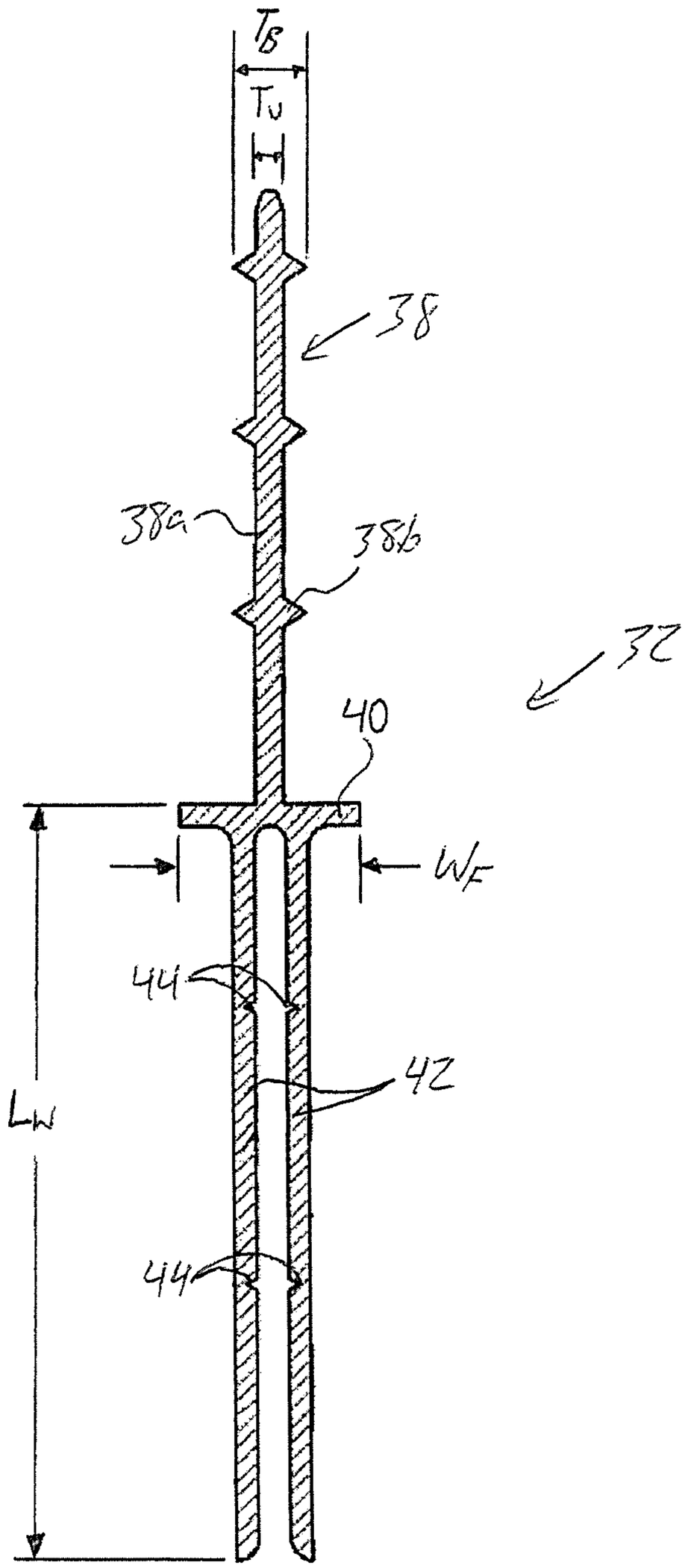

FIG. 3

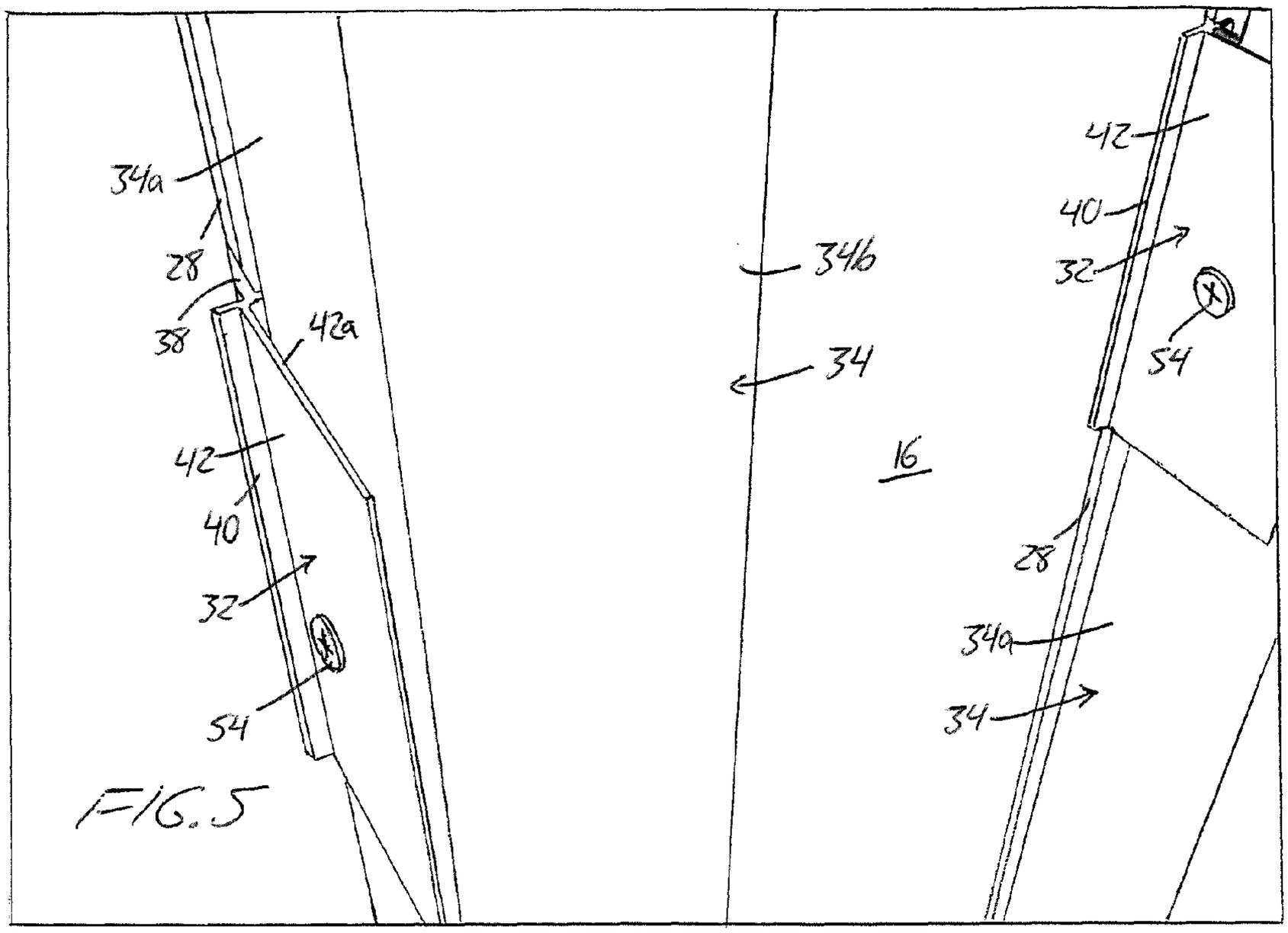
34a
28
38
42a
42
40
32
54
34b
34
16
42
40
32
54
28
34a
34

FIG. 5

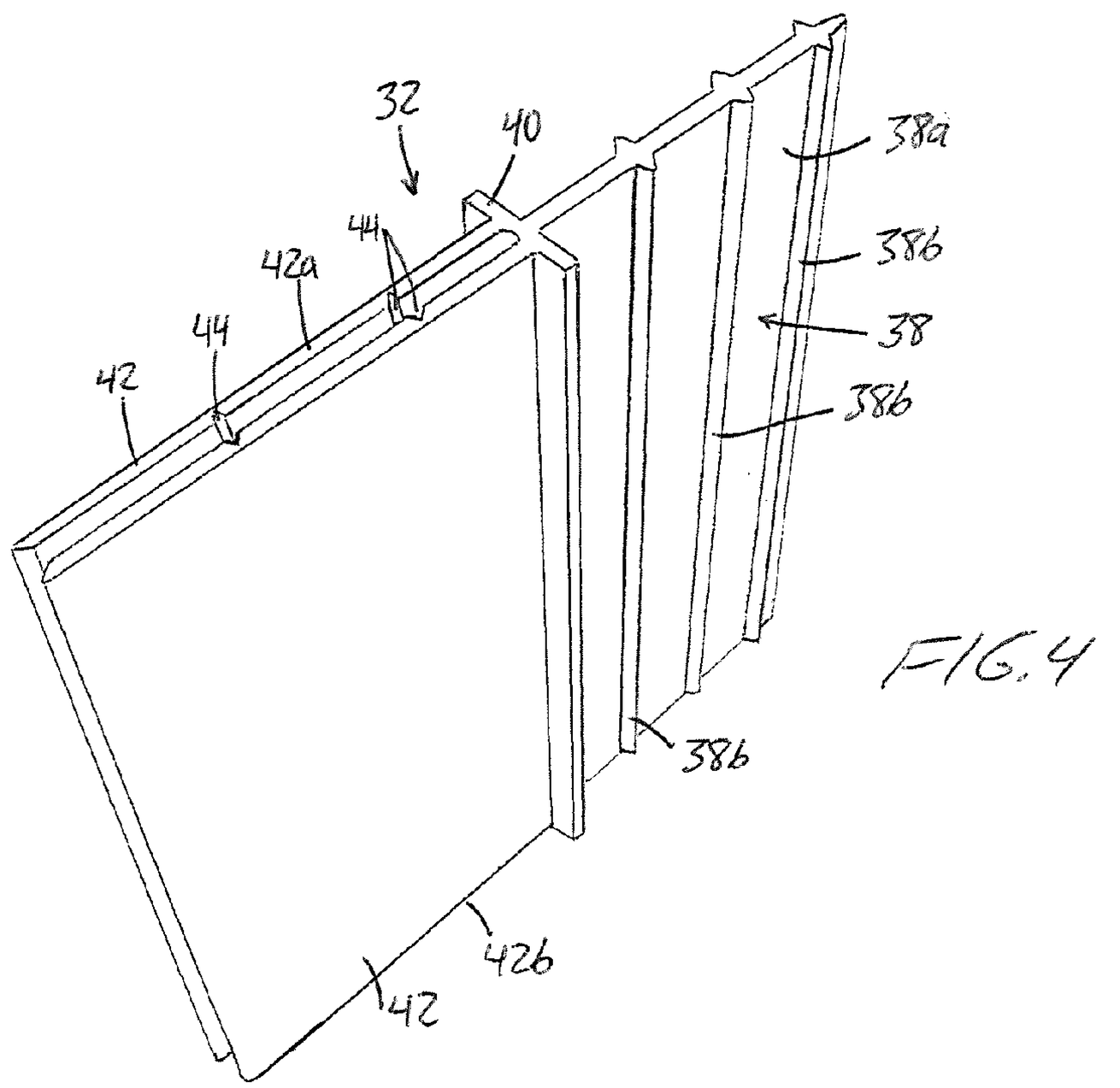
32
40
44
42a
44
42
38a
38b
38
38b
38b
42b
42

FIG. 4

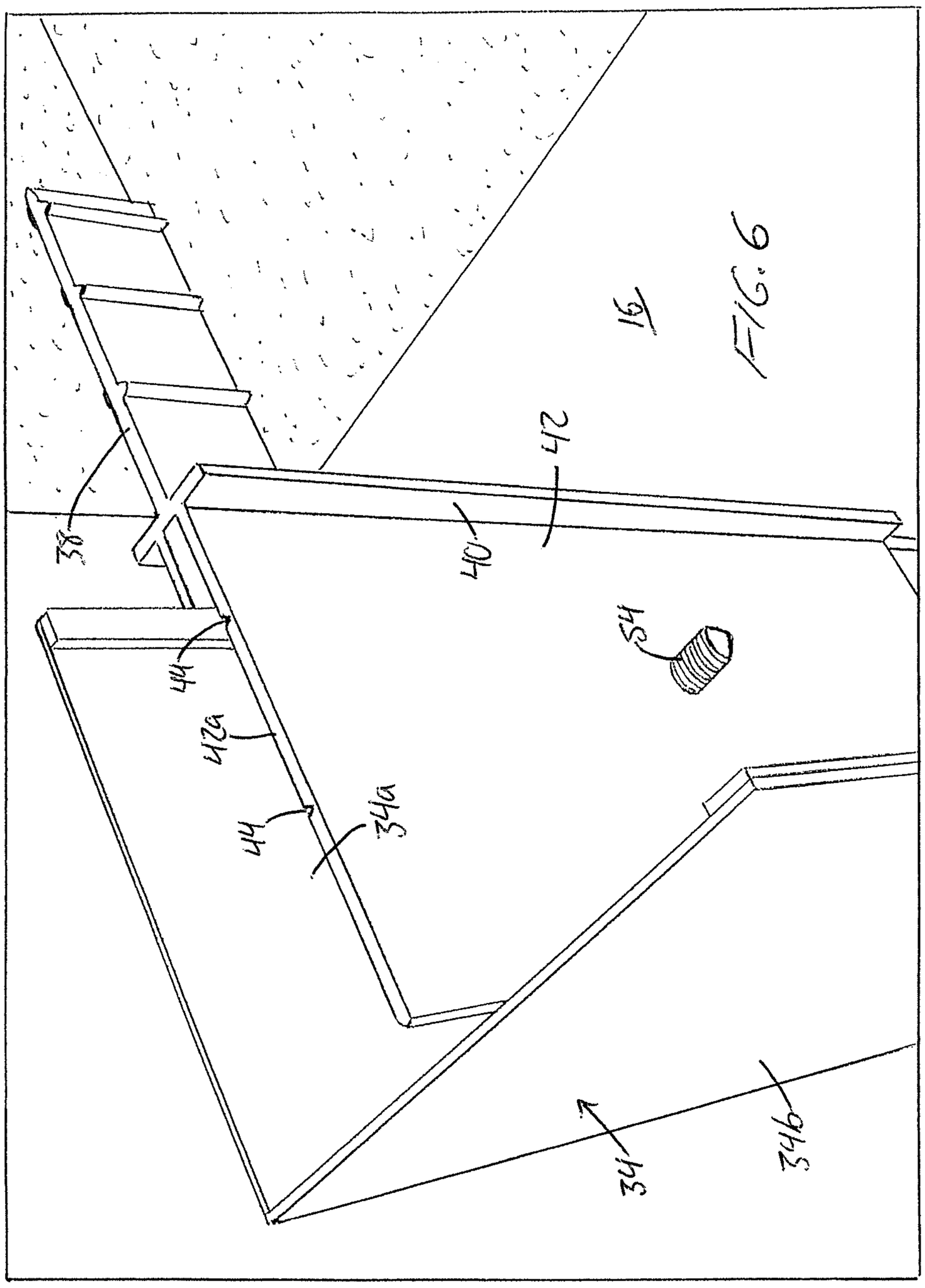

FIG. 6

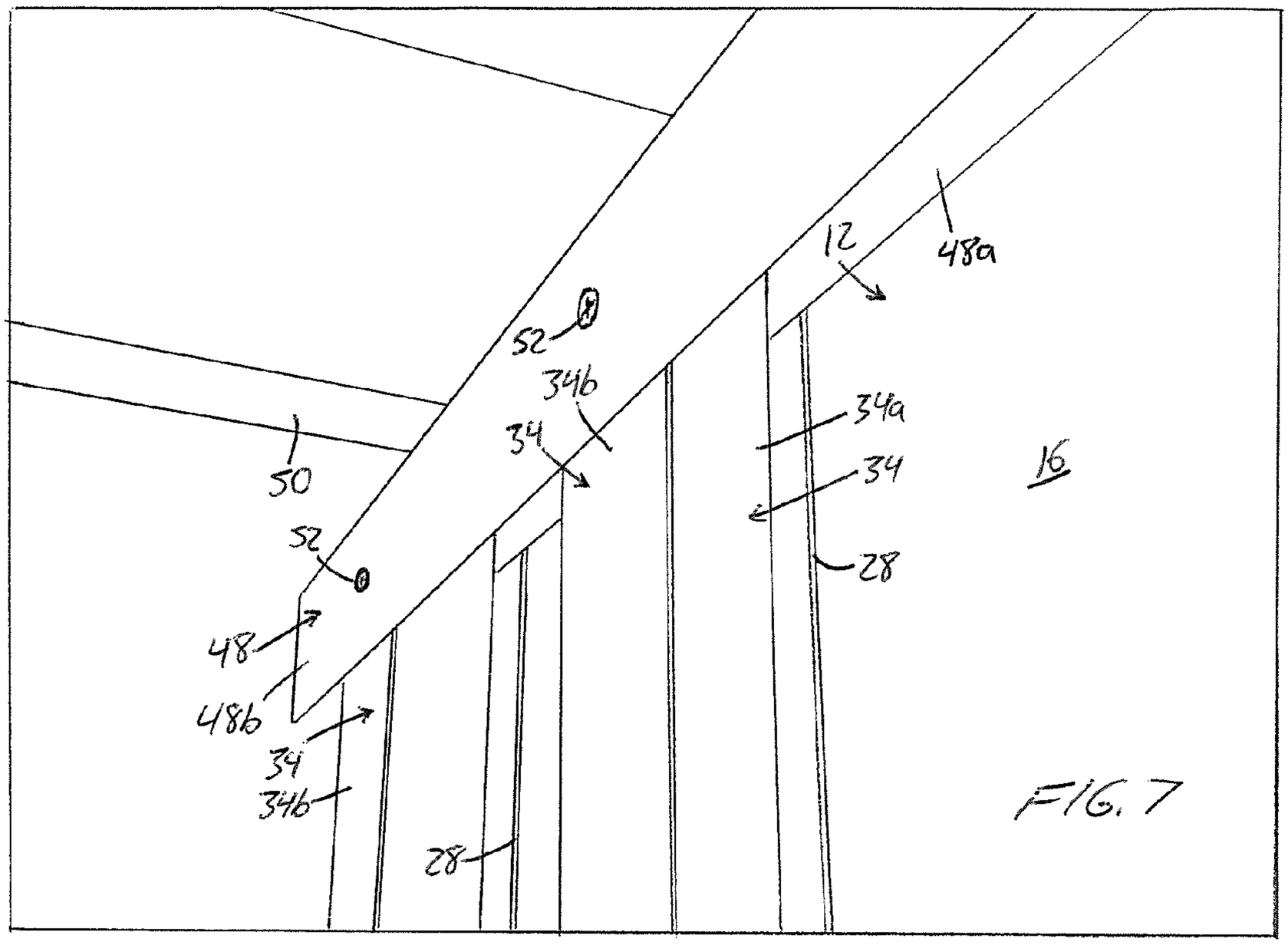
12
48a
52
34b
34
34a
34
16
50
52
28
48
48b
34
34b
28

FIG. 7

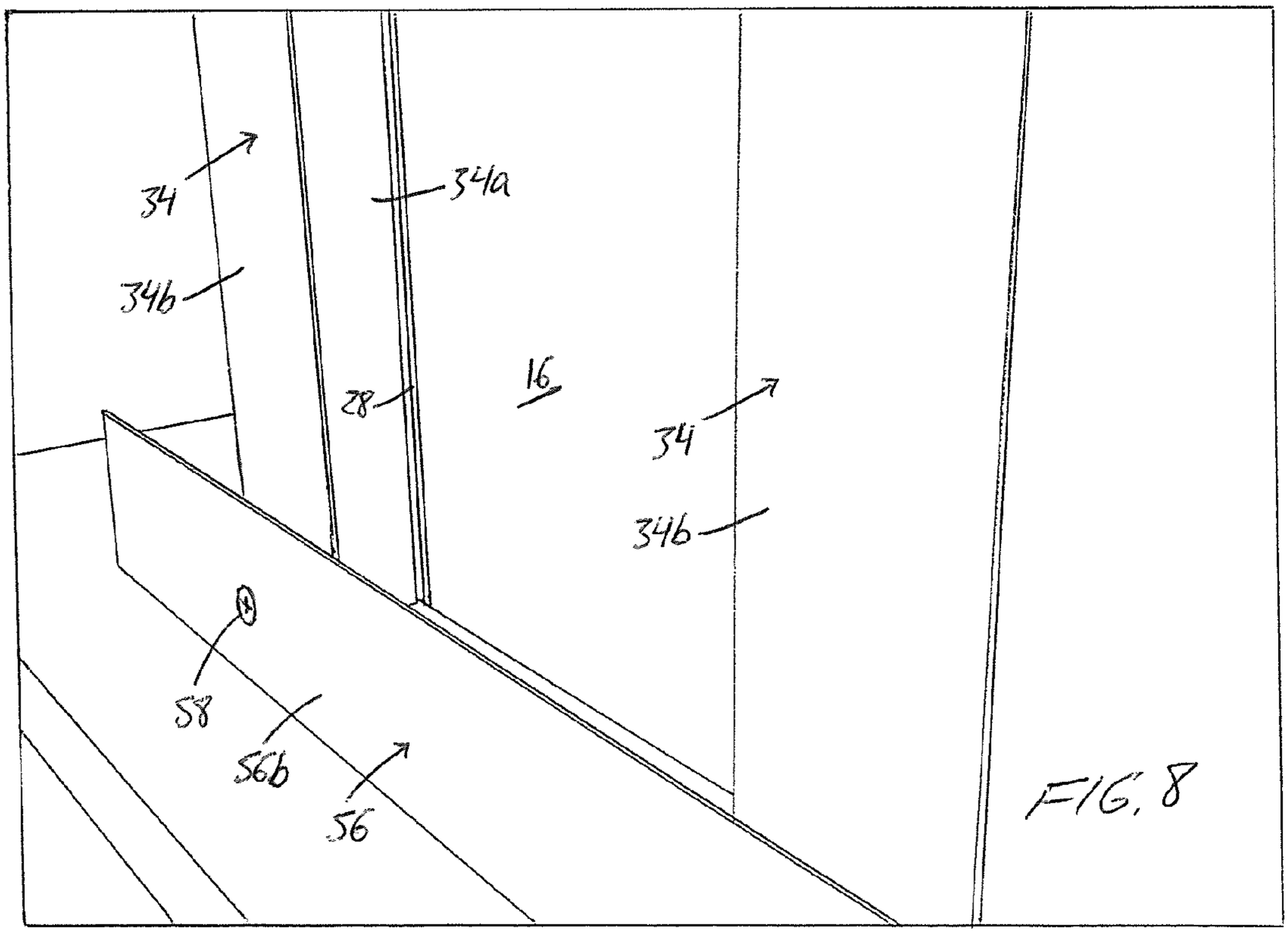
34
34a
34b
16
28
34
34b
58
56b
56

FIG. 8

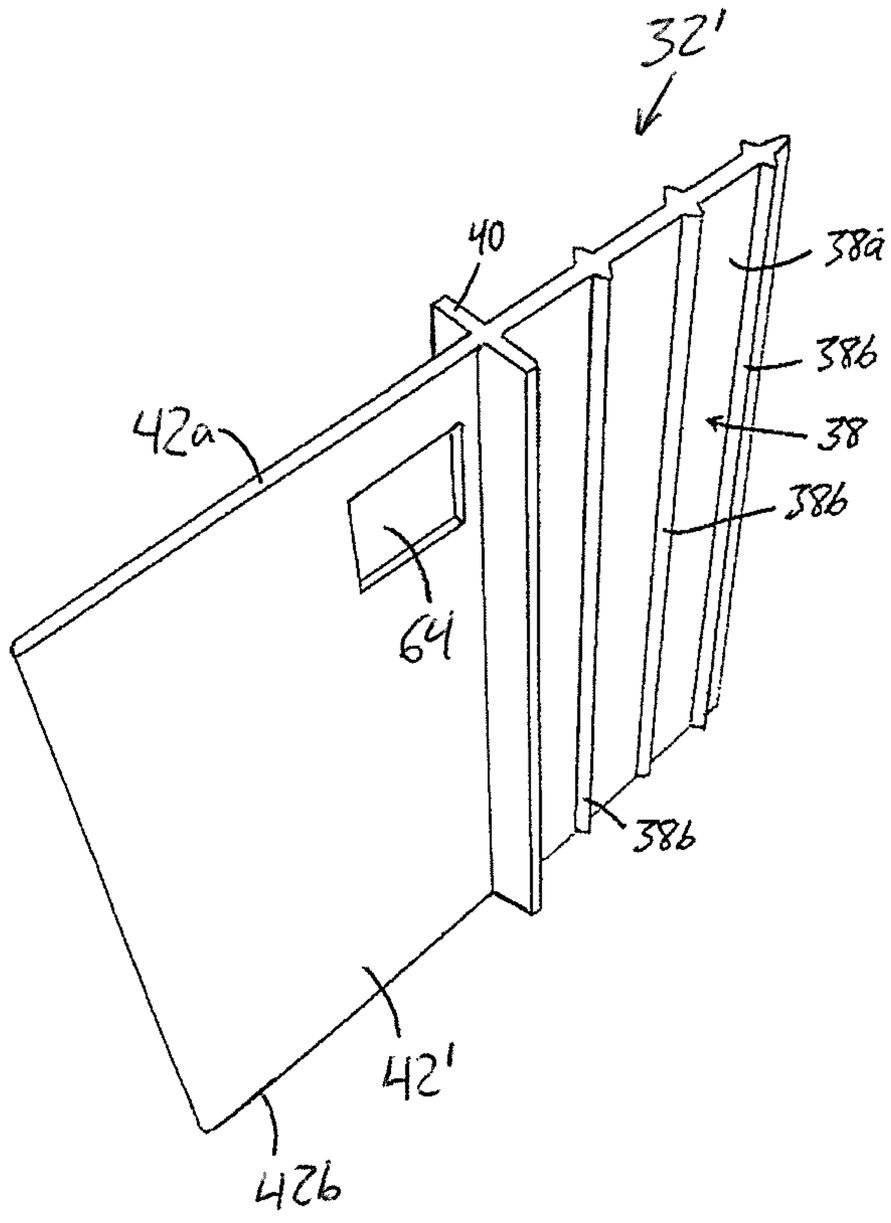
32'
40
38a
38b
38
38b
38b
42a
64
42'
42b

FIG. 9

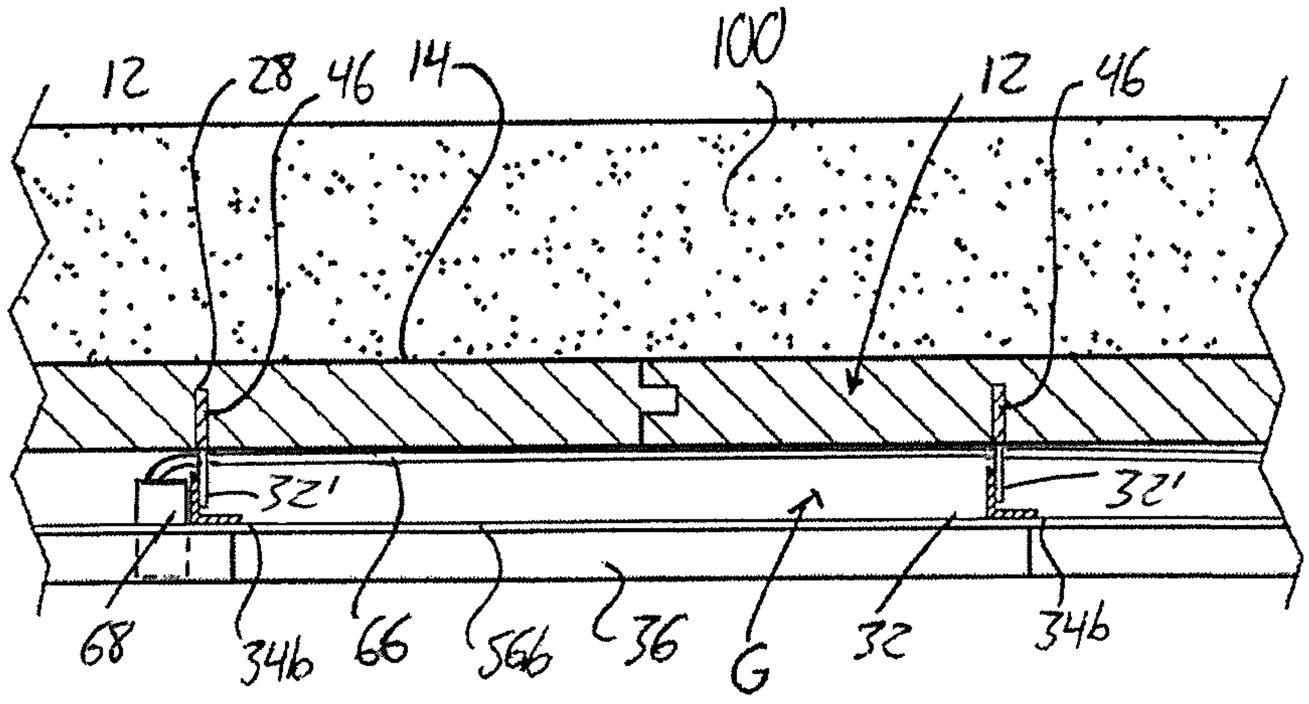
12
28
46
14
100
12
46
32'
32'
68
34b
66
56b
36
G
32
34b

FIG. 10

INSULATING WALL ASSEMBLY WITH FRAMING MEMBER SUPPORTS PARTIALLY EMBEDDED WITHIN RIGID INSULATION PANELS

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims benefit under 35 U.S.C. 119(e) of Provisional Application Ser. No. 62/077,515, filed Nov. 10, 2014, the entirety of which is incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates generally to insulating wall assemblies in which framing members are attached to rigid insulation panels in order to support wall finishing panels at a spaced distance from interior faces of the rigid insulation panels, and more particularly to an insulating wall assembly of this type in which a plurality of supports are partially embedded into the insulation panels so to reach outward from the interior faces thereof for fastening of the framing members to these supports in an adjustable enabling plumb installation of the framing members.

BACKGROUND

Applicant's prior U.S. Pat. No. 8,640,416 discloses a concrete insulation system (CIS) for improving insulation of concrete walls e.g. foundation walls, by mounting rigid foam insulation panels over the interior surface of the concrete, while providing adjustable mounting of wall framing members that enables plumb positioning of same in order to attain a truly planar and vertical interior wall when drywall sheets or other wall finishing panels are mounted over the framing members.

In the aforementioned patent, framing members of T-shaped cross-section each had the web or stem of its T-shaped cross section adjustability received in a groove or slot of a respective foam post that was adhered to the concrete wall in a position matingly fitted between two adjacent insulation panels.

Applicant has developed a new CIS with a unique combination of elements that eliminates the need for foam posts between the adjacent insulation panels, and may be used to reduced the number of bulky components required to assemble the CIS, thereby improving the ease of installation and ease and cost of transport to the installation site.

SUMMARY OF THE INVENTION

According to a first aspect of the invention, there is provided an insulating wall system comprising:

a plurality of insulation panels each having interior first face for facing a first direction relative to an interior space of a building, an opposing second face for facing an opposite second direction relative to said interior space of the building, and at least one slot recessed into the body of insulation from the first face thereof and running longitudinally between a pair of opposing perimeter edges of said body of insulation;

a plurality of supports each having an insertion portion insertable into the slot of each insulation panel and a fastening portion arranged to project outwardly from the first face of said insulation panel with the insertion portion received in the slot of said insulation panel, whereby a series of framing members are fastenable to the fastening portions of the supports to define a framework on which wall finishing panels are mountable over the insulation panels at a spaced distance from the first face thereof.

Spray foam insulation may be sprayed into the slots of the insulation panels to secure the insertion portions of the supports within said slots.

Preferably the insertion portion of each support is barbed to resist withdrawal of said insertion portion from the slot in the insulation panels.

Preferably each slot runs longitudinally between opposing upper and lower perimeter edges of one of the insulation panels.

According to a second aspect of the invention, there is provided an insulating wall system comprising:

an insulating panel comprising:

a first face for facing a first direction relative to interior space of a building;

an opposing second face for facing an opposite second direction relative to said interior space of the building;

at least one support having one end anchored within the insulation panel and having a fastening portion projecting from the first face of the insulation panel to enable fastening of a framing member to the fastening portion of the support for subsequent mounting of a wall finishing panel to the frame member at a spaced distance from the first face of the insulation panel.

Preferably the system includes a plurality of framing members each having a longitudinal dimension and a cross-sectional shape in planes normal to said longitudinal dimension, said cross-sectional shape comprising a pair of diverging legs, including a fastening leg for fastening to fastening portion of the support in face-to-face relationship therewith, and a supporting leg carried by the fastening leg in a position lying cross-wise to the fastening portion so as to face away from the insulation panels to present a surface for fastening of the wall-finishing panels to the supporting legs of said plurality of framing members at a distance from the insulation panels.

Preferably each support comprises a positioning portion lying cross-wise to the insertion and fastening portions where said insertion and fastening portions join together, whereby abutment of said positioning portions of the supports against the first faces of the insulation panels denotes fully inserted positions of the supports within the slots of said insulation panels.

Preferably:

a plurality of the insulation panels are fitted together end-to-end with the first faces of said insulation panels facing the first direction relative to the interior space of the building and the opposing second faces facing the opposing second direction relative to said interior space of the building;

at each one of a plurality of spaced apart locations along the fitted together insulation panels, a respective set of the supports project from the first faces of the insulation panels at spaced apart positions along a linear path running between a pair of opposing perimeter edges of one of said insulation panels; and

a respective framing member is fastened to each set of supports with a longitudinal dimension of said framing member running along the linear path of said set of supports, and each framing member, in planes normal to said longitudinal dimension, has a cross-sectional shape with a pair of diverging legs, a first one of said diverging legs being fastened face-to-face with the respective set of supports at the fastening portions thereof, and a second one of said

diverging legs lying cross-wise to the first leg and facing away from the insulation panels to present a surface for fastening of the wall-finishing panel to said second one of the diverging legs.

Preferably each support has a pre-defined through-hole in the fastening portion thereof for routing of one or more lines therethrough in an assembled wall featuring said supports.

According to a third aspect of the invention, there is provided an insulating wall assembly comprising:

a plurality of insulation panels fitted together end-to-end with first faces of said insulation panels facing a first direction relative to an interior space of a building and an opposing second face facing an opposing second direction relative to said interior space of the building;

at each one of a plurality of spaced apart locations along the fitted together insulation panels, a respective set of supports projecting from the first faces of the insulation panels at spaced apart positions along a linear path running between a pair of opposing perimeter edges of one of said insulation panels, each support of said set having one end anchored within said one of the insulation panels;

a respective framing member fastened to each set of supports with a longitudinal dimension of said framing member running along the linear path of said set of supports, each framing member, in planes normal to said longitudinal dimension, having a cross-sectional shape with a pair of diverging legs, a first one of said diverging legs being fastened face-to-face with the respective set of supports at fastening portions thereof that project from the insulation panel, and a second one of said diverging legs lying cross-wise to the first leg and facing away from the insulation panels to present a surface for fastening of wall-finishing panels to said second one of the diverging legs.

Preferably each linear path runs longitudinally between opposing upper and lower perimeter edges of one of the insulation panels.

The fastening portion of each support may be slotted to allow insertion of the fastening leg of one of said framing members into said fastening portion.

The fastening portion of each support may comprise at least one line of weakness at which a thickness of the fastening portion is reduced to present a break-away or cut-away line for removal of a distal section of the fastening portion to reduce a length by which the fastening portion projects from the insertion portion.

Preferably each framing member is a right-angle channel.

Preferably the wall assembly further comprises an upper framing connector that is fastened to bottom edges of ceiling or floor joists and resides at a distance from the insulation panels on a side thereof faced by the first faces, the upper framing connector extending along the insulation panels and the framing members are fastened to the upper framing connector to hang therefrom.

Preferably the upper framing connector comprises a right angle channel member with one cross-sectional leg that is fastened to the bottom edges of the ceiling or floor joists, and another cross-sectional leg from which the framing members are hung.

Preferably each insulation panel has upright side edges that are configured with matingly shaped male and female features to enable fitting together of an adjacent pair of said plurality of insulation panels in end-to-end relation by mating of the male and female features of said adjacent pair of said plurality of adjacent insulation panels.

According to a third aspect of the invention, there is provided a method of assembling an insulating wall assembly, the method comprising:

providing a plurality of insulation panels each having a first face for facing into an interior space of a building, and an opposing second face for facing an opposite second direction relative to said interior space of the building;

providing a plurality of supports;

anchoring each support in one of the plurality of insulation panels such that one end of the support is anchored within the insulation panel and a fastening portion of the support extends outwardly away from the first face of the insulation panel, whereby the fastening portions of the supports are available for fastening of framing members thereto for subsequent mounting of wall finishing panels to the frame members at a spaced distance from the first faces of the insulation panels.

Preferably the step of anchoring each support comprises inserting the one end of each support into a slot that is recessed into the insulation panel at the first face thereof, said slot running longitudinally between a pair of opposing perimeter edges of said insulation panel.

The step of anchoring each support may comprise applying spray foam into the slot to embed the one end of the support within said spray foam, which sets in place within the slot to anchor the support to the insulation panel.

Preferably the step of anchoring each support is performed at a site of the building where the insulating wall assembly is to be installed.

Preferably the insulation panels are transported to the site of the building in a flat-stacked condition with one another at their first and second faces, prior to the step of anchoring each support.

Preferably the method comprises fitting the insulation panels together end-to-end at upright side edges thereof, and with the insulation panels fitted together and standing upright, fastening the framing members to the fastening portions of the supports to enable the subsequent mounting of wall finishing panels to the frame members.

Preferably, before fastening the framing members, (i) an upper framing connector is fastened to bottom edges of ceiling or floor joists at a distance from the upright-standing insulation panels on a side thereof faced by the first faces such that the upper framing connector extends along the insulation panels; and (ii) the framing members are suspended from the upper framing connector with lower ends of the framing members in free-hanging states allowing self-plumbing of the framing members under a pendulum-like movement relative to the upper framing connector prior to fastening of the framing members to the fastening portions of the supports.

Preferably the upper framing connector comprises a right angle channel, and the method comprises fastening one cross-sectional leg of the right angle channel to the bottom edges of the ceiling or floor joists, and hanging the framing members from the other cross-sectional leg of the right angle channel.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention will now be described in conjunction with the accompanying drawings in which:

FIG. **1** is a horizontal cross-section of an insulating wall assembly according to one embodiment of the present invention, as viewed along line A-A of FIG. **2**.

FIG. **2** is a vertical cross-section of the insulating wall assembly of FIG. **1**, as viewed along line B-B thereof.

FIG. **3** is a horizontal cross-section of a framing member support clip of the insulating wall assembly, as viewed along line C-C of FIG. **2**.

FIG. **4** is a perspective view of the framing member support clip of FIG. **3**.

FIG. **5** is a perspective view illustrating a fastened connection of a right-angle framing member of the insulating wall assembly to one of the framing member support clips, as seen from one side of the framing member support clip.

FIG. **6** is a perspective view illustrating the fastened connection of FIG. **5**, as seen from an opposing side of the framing member support clip, but with an insulation panel of the insulating wall assembly partially cut away to show anchoring of the framing member support clip to the insulation panel by a barbed fin of the framing members support.

FIG. **7** is a perspective view showing fastened connection of the framing members of the insulating wall assembly to an upper framing connector that is fastened to the bottom edges of overhead floor or ceiling joists so as to run along the insulation panels near the top edge thereof at a spaced distance from the insulation panels.

FIG. **8** is a perspective view showing fastened connection of the framing members of the insulating wall assembly to a lower framing connector that is fastened to the floor in parallel alignment with the upper framing member connector.

FIG. **9** is a perspective view similar to FIG. **3**, but showing a variant of the support clip which includes a through-hole therein for routing of electrical wiring or other lines within the insulating wall assembly.

FIG. **10** is a horizontal cross-section similar to FIG. **1**, but illustrating use of the support clip of FIG. **9** to route electrical wiring in the insulating wall assembly.

In the drawings like characters of reference indicate corresponding parts in the different figures.

DETAILED DESCRIPTION

FIG. **1** illustrates a horizontal cross-section of an insulating wall assembly **10** according to an embodiment of the invention, as taken from a plane perpendicular to the major surfaces of a vertically-erect concrete foundation wall **100** of a building.

The insulating wall assembly **10**, hereinafter also referred to as a "wall assembly" for brevity, includes a plurality of rigid foam insulation panels **12** each having a non-coated exterior face **14** that faces toward the concrete foundation wall **100** and away from an interior space of the building, an interior face **16** that faces away from the concrete foundation wall **100** into the interior space of the building and that is optimally coated with a reflective layer for enhancing the resistance to heat transfer such as through radiation. Perimeter edges of the panel include opposing top and bottom perimeter edges, and two opposing vertically upright side edges **18**, **20**. One of the upright side edges **18** features a male tongue **22** spanning the vertical length thereof and projecting laterally outward from the remainder of the side edge **18**. The other upright side edge features a female groove **24** recessed therein and spanning the vertical length thereof. The tongue and groove are of mating size and shape, whereby insertion of the tongue of one of the panels **12** into an adjacent one of the panels cooperatively fits the tongue and groove together so as to join the adjacent panels together end-to-end in coplanar relationship with one another.

The joined together panels **12** are attached to the concrete foundation wall **100** by adhesive, or other suitable attachment means, in a position placing the exterior faces **14** of ten insulation panels **12** in abutment against the concrete foundation wall **100**. The insulation panels each have the same uniform thickness between their interior and exterior faces **14**, **16**, and the mating tongue and groove at the interface **26** between each pair of adjacent panels maintains this uniform thickness so that the mating panels form a uniform layer of insulation over the interior surface **16** of the concrete foundation wall **100**. This insulation layer is formed exclusively by the series of insulation panels **12**, with no intermediates between them.

Each insulation panel **12**, at one or more intermediate locations between the two upright side edges **18**, **20** thereof, features a narrow elongated slot **28** of rectangular cross-section that runs linearly between a horizontal top edge of the panel and an opposing horizontal bottom edge thereof. The slot folllows a vertical path between these top and bottom perimeter edges, each of which spans between the two vertically upright side edges **18**, **20** of the insulation panel so that these four perimeter edges cooperatively define the overall rectangular perimeter of the panel. The slot is recessed into the panel **12** from the interior face **16** thereof, with a depth that reaches partially through the panel toward the opposing exterior face **14**, but stopping short thereof. In other words, the depth of the slot **28** is less than the thickness of the panel **12**.

FIGS. **1** and **2** illustrate the wall assembly **10** in a fully installed state, in which a plurality of framing member support clips **32** have been anchored in each slot **2**. In each slot **28**, the respective set of support clips are vertically spaced from one another along the slot's linear path between the top and bottom perimeter edges of the panel. For each slot **28**, a respective upright framing member **34** is provided in the form of a length of right-angle channel, and has one of its two cross-sectional legs **34***a* engaged with the respective set of clips **32** that are anchored in the slot **28**. Accordingly, the longitudinal dimension of the framing member **34** stands vertically upright in front of the interior face **16** of the insulation panel **12**. The second cross-sectional leg **34***b* of the framing member **34** lies perpendicularly cross-wise to the first leg **34***a* in cross-sectional planes of the framing member (i.e. planes lying normal to the longitudinal dimension of the framing member **34**). This second cross-sectional leg **34***b* is situated at a distance spaced outwardly from the interior face **16** of the panel **12** past the distal ends of the clips **32** that project outward from the interior face **16** of the panel **12**

With a series of framing members **34** installed in this manner so to reside at horizontally spaced intervals along the plane of the insulation panels **12**, and with each framing member being carried by the clips **32** of a respective one of the slots **28**, sheets or panels **36** of drywall or other wall finishing material can be fastened to the second legs **34***b* of the framing members in edge-to-edge relation with one another so as to form a generally continuous and planar finished interior wall surface of the wall assembly. The outer surface of the second cross-sectional leg **34***b* facing away from the interior face of the insulation panel presents a surface for placement and fastening of the drywall or other finishing panels. The framing members act to the space the wall finishing panels outward from the interior faces **16** of the insulation panels **12**. This space between the insulation panels **12** and the wall finishing panels **36** may be left empty to define an airspace between them, or may be partially or entirely filled with additional layers of insulation material (e.g. fiberglass batt insulation). In either case, the air-filled or insulation-filled gap contributes to the thermal insulation performance of the wall assembly.

FIGS. **3** and **4** show one of the clips **32** in isolation, and disclose further detail of the clip structure than revealed by the schematically illustrated and partially embedded clips **32** of FIGS. **1** and **2**. Each clip features a barbed fin **38** that forms an insertion portion of the clip **32** that is engaged into the respective slot **28** of the insulation panels **12** during assembly of the wall system. A thickness T_U of the unbarbed areas **38***a* of the fin **38** is approximately equal to the width of the slots **28** in the insulation panels **12**, which are preferably predefined slots created during manufacture of the panels **12**. The barbs **38***b* that project laterally outward from the fin at spaced intervals therealong are dimensioned to allow the fin **38** to be manually forced into the slot, against the frictional resistance that is created between the tips of the barbs and the foam walls of the slot **28**. After insertion of the clip **32** in the slot, there is enough interference between the tip-to-tip barb width T_B of the clip and the predefined width of the panel slot **28** to frictionally hold the clip **32** in place at its inserted position in the slot, at least one a temporary basis. Accordingly, at the building site at which the insulating wall **10** is to be installed, an installer can manually insert a respective set of two or more clips into several slots (e.g. all the slots along a particular foundation wall that is to be insulated), before moving on to a next step of further anchoring the clips in place later, as described herein further below.

With continued reference to FIGS. **3** and **4**, a stop flange **40** of the clip **32** lies perpendicularly to the barbed fin **38** at one end thereof, and projects laterally outward from both sides of the fin **38**. A width W_F of the stop flange **40** exceeds the width of the slot **28** in the insulation panel **12**, whereby the stop flange **40** limits the distance by which the barbed fin **38** can be inserted into the slot. That is, once the fin **38** is fully inserted into the slot **28**, the stop flange **40** abuts against the interior face **16** of the insulation panel **12** on either side of the slot **28** in order to prevent further penetration of the clip **32** into the insulation panel. The stop flange **40** thus defines a positioning portion of the clip that governs the fully inserted position of same.

On the side of the stop flange **40** lying opposite to the barbed insertion fin **38**, the clip **32** features two clip walls **42** each lying parallel to the plane of the fin **38** on opposite sides thereof, and extending from the flange **40** in the direction opposite the fin. The space between the two clip walls **42** equals or slightly exceeds the thickness of the leg **34***a* of the framing member that is to be fastened to the clip **32**, whereby this fastening leg **34***a* of the framing member can be slid into the space between the two clip walls **42** at the distal end of the clip. The space between the two clip walls **42** thus acts as a slot into which the fastening leg **34***a* of the framing member **34** is insertable, whereby the clip walls **42** define a slotted fastening portion of the clip **32**. When the clip **32** is inserted in to one of the slots **28** in the insulation panels **12**, the barbed fin **38** lies in the same vertical plane as the slot **28**, and the clip walls **42** lie in respective vertical planes that are perpendicular to the interior face **16** of the insulation panels, parallel to the plane the slot **28**, and located on opposing sides of the slot **28**.

Each clip wall **42** features one or more lines of weakness **44** (specifically two such lines in the illustrated embodiment, although the number may vary) where the wall thickness is reduced relative to the remainder of the wall **42** in order to create a break-line or cut-line along which the wall **42** can be snapped or cut to reduce the length of the wall L_W, as measured from the stop flange **40**. In the illustrated embodiment, each such line of weakness is formed by a v-shaped groove running perpendicularly from a top edge **42***a* of the wall **42** to an opposing bottom edge thereof **42***b* on an inner side of the respective clip wall **42** that faces the other clip wall **42**. Alternatively, each line of weakness may be formed by a recess or groove on the outer side of the clip wall **42**, or by a respective pair of recesses or grooves on both sides of the clip wall. A distal section of the clip wall **42** situated on the side of break or cut line **44** opposite the stop flange **40** can be snapped off (e.g. manually, or with the aid of tools, such as pliers) or cut off with a pair of scissors or tin snips, a utility knife, or the other cutting tool.

With reference to FIG. **1**, this ability to reduce the wall length L_W of the clip **32** can be used together with selection of angle shaped framing members **34** of shorter cross-sectional leg length to reduce the size of the air space or gap G between the interior faces **16** of the insulation panels **12** and the wall finishing panels **36**. That is, trimming the wall length L_W of the clips **32** shortens the distance by which the clips **32** extend from the interior face **16** of the insulation panels **12**, and thus allows shortening of the distance by which the drywall support legs **34***b* of the framing members **34** are spaced from the insulation panels **12** in the finished wall assembly **10**.

In the illustrated embodiment, the insertion fin **38** of the clip **32** is of flat plate-like or planar form, except at the barbs **38***a* thereof. As a result, a longitudinal dimension of the insertion fin **38** measured in the lengthwise direction of the slot **32** exceeds the thickness of the fin by several times, and a lengthwise span of the slot **32** occupied by the fin is therefore notably greater than that the slot width. Abutment of the opposing sides of this plate-like fin **38** with the opposing sides of the slot resists twisting of the clip about an axis normal to the interior surface of the insulation panels better than other clip embodiments featuring a post or shaft-like insertion portion whose dimensions across and along the slot are equal or similar to one another. The illustrated embodiment uses multiple clips per slot at vertically spaced positions therein, each clip being many times shorter than the slot in this longitudinal dimension. Another embodiment may instead employ a single clip of notably greater length in each slot to support the respective framing member over a substantial length thereof. However, using a set of two or more smaller clips provides sufficient support strength for the framing members, reduces the clip size for more convenient handling and more efficient transport, and reduces the overall material cost of the wall assembly.

After the clips **32** have been inserted into the slots **28**, preferably during on-site installation of the wall assembly **10**, the clips **32** are then anchored more securely and permanently to the insulation panels by application of spray foam insulation **46** into the slots, at least at the portions of the slots where the barbed insertion fins **38** of the clips **32** reside. The spray foam fills in any empty space between the insertion fin **38** and the foam walls of the slots **28**. Allowed to set or cure, the spray foam bonds to the foam walls of the slots. As a result, the barbed insulation fin **38** of the clip **32** is now embedded within the resulting foam body made up of a combination of the insulation panel's original factory-provided foam content, and the hardened spray foam that was applied at the installation site. The clip **32** is therefore now firmly and permanently anchored to the insulation panel.

The clips **32** may be installed in the forgoing manner either before or after erection and attachment of the insulation panels **12** at the concrete foundation wall. After such erection and attachment of the insulation panels, and either before or after attachment of the clips **32** thereto, an upper frame connector **48** is installed in a position running hori-

zontally parallel to the plane of the insulation panels **12** at short distance outward from the interior face **16** thereof at or near the plane of the of the top edges of the insulation panels **12**. The upper frame connector **48** is secured in this position by fastening of the upper frame connector to a suitable overhead support structure, such as the bottom edges of a series of overhead floor or ceiling joists **50** that are situated above the insulation panels, as shown in FIG. **2**. The upper frame connector **48** of the illustrated embodiment is made of the same right angle channel as the framing members **34**, and has one cross-sectional leg **48***a* thereof fastened to the underside of the floor or ceiling joists **50**. The other cross-sectional leg **48***b* of the upper frame connector **48** lies perpendicularly to the first leg **48***a*, and hangs downwardly therefrom.

With the upper framing connector **48** and the clips **32** both secured in place, each framing members **34** is then installed. To do this, the fastening leg **34***a* of the framing member is slid into the slotted space between the two clip walls **42** of each clip **32** in the respective slot **28** of the insulation panels, and in doing so the upper end of the frame member **34** is lifted up into the space between the insulation panels **12** and the hanging leg **48***b* of the upper framing connector **48**. Here, the upper end of the drywall support leg **34***b* of the framing member is fastened to the hanging leg **48** of the upper framing connector **48** so as to hang the framing member **34** from the hanging leg **48***b* on the side thereof facing the insulation panels **12**. This can be seen in FIG. **7** where screw **52** hangs the framing member **34** from the upper framing connector **48**.

In this state, where the framing member is supported solely by this single-point fastening at the upper frame connector **48**, the framing member **34** acts as a pendulum to self-plumb itself (i.e. self-align itself into a vertical orientation) in the plane of the slot **28**, as the currently free-hanging bottom end of the framing member **34** will swing itself into vertical alignment below the fastened top end of the framing member. Under such pendulum-like action of the framing member **34**, the fastening leg **34***a* of the framing member will swing toward or away from the stop flanges **40** of the respective set of clips within the slotted space between the clip walls **42** thereof.

At this point, with the framing member hanging in a truly vertical orientation in the plane of the slot **28**, regardless of whether the trueness of the insulation panel **12** in this plane, which may vary e.g. due to an uneven interior surface of the concrete foundation wall **100**, the framing member **34** is then fastened to the respective set of clips **32**. This can be seen in FIGS. **5** and **6** where a screw **54** has been driven through the two clip walls **42** of the clip **32**, and in doing so, engages through the supporting fastening **34***a* of the framing member to fasten it in place within the slotted space of the clip **32**.

To further reinforce the installed positions of the framing members **34**, a lower framing connector **56** is then added in order to join together the lower ends of the framing members **34** in a manner similar to that in which the upper framing connector **48** joins together the upper ends of the framing members. The illustrated lower framing connector **56** may be the same type of right angle channel as the upper framing connector **48**. One of the lower connector's cross-sectional legs **56***a* is fastened to the floor so that it's other cross-sectional leg **56***b* stands upward therefrom, and the first cross-sectional leg **56***a* is slid into place the under the lower ends of the framing members **34** until the second cross-sectional leg **56***b* of the lower framing connector **56** abuts up against the drywall support legs **34***b* of the framing members **34**. With the framing members self-plumbed into a proper vertical orientation, this will automatically align the lower framing connector **56** with the upper framing connector **48**. The upstanding cross-sectional leg **56***b* is then fastened to the drywall support leg **34***b* of each framing member **34**, as shown by screw fastener **58** in FIG. **8**.

With the framing members and connectors all assembled in this manner to form a similar framework similar to a traditional stud wall (in which the framing members **34** correspond to the studs, and the upper and lower framing connectors **48**, **56** correspond to the top and bottom plates), the framework is now ready for the mounting of drywall or other finishing panels **36** thereto. The drywall support legs **34***b* of the self-plumbing framing members **34** lie coplanar with one another in a vertical plane in order to support these finishing panels **36** in a proper coplanar, vertical condition for a flat and true finished wall. As shown in FIG. **1**, the vertical edges of adjacent finishing panels **36** are abutted against one another in front of the drywall supporting leg **34** of one of the framing units for fastening of both panels to this same framing member. Additional fasteners may be used to secure the finishing panels **36** to the hanging leg **48***b* of the upper framing connector **48** near the top edges of the finished wall, and to the upstanding leg **56***b* of the lower framing connector **56** near the bottom edges of the finished wall.

The slots **28** in the insulation panels are preferably created during the manufacturing process, whereby an accurate linear path of the factory-defined slots ensures alignment of the clips **32** of each set with one another during on-site assembly, and installation time is reduced compared to other embodiments in which creation of clip-accommodating slots is instead performed on-site during the installation process. As an alternative to vertical slots **28** running between top and bottom edges of the insulation panels, horizontal slots could be employed to accommodate mounting of the clips, where one slot would accommodate a single clip in each set of vertically spaced clips to which a respective framing member is to be mounted. In another embodiment, instead of mounting multiple clips within an elongated slot spanning all or a substantially majority of the insulation panel, an array of recesses or openings at predefined positions spaced out over the interior faces of the insulation panels may be used to individually mount each support clip. As an alternative to using recesses or openings to accommodate mounting of the clips, other embodiments may embed the clips into the insulation panels as part of the manufacturing process. However, on-site post-manufacture installation of the clips is preferable due to the ability to flat-pack the insulation panels together at their interior and exterior for space and cost efficient transport and handling.

Although the framing member supports **32** are described above as clips due the dual-wall configuration **42** of the slotted fastening portion of the clip that embraces around both sides of the fastening leg **34***a* of the framing member, other embodiments may have a single wall effectively acting as a fastening flange that resides on only one side the fastening leg **34***a* of the framing member. In other words the fastening leg **34***a* of each framing member may be placed face-to-face beside a flat, unslotted fastening portion of a single wall support, or placed face-to-face with both walls of a slotted fastening portion like that of FIGS. **3** and **4**.

In one embodiment, the air gap G in the finished wall assembly may preferably be approximately 2" wide to accommodate the installation of electrical boxes. In areas where electrical boxes are typically not located however, an air gap of approximately ¾" wide may be sufficient to

provide a suitable insulating capacity. The foam core material of the insulating panels **12** may be Expanded Poly-Styrene ("EPS") foam sheets with a desirably sufficient insulation and R-value. In some embodiments, the exterior face of the foam panels in contact with the foundation wall may each optionally include a reflective layer such as a foil layer, similar to the reflective layer coated on the interior face of the foam panels, to act as a vapour barrier to resist the diffusion of moisture through the foundation wall, and to reduce radiative heat transfer from outside the structure during summer, for example.

The clips are preferably plastic, but may alternatively be formed of metal or other materials that would provide suitable support strength and allow fastening together of the clips and framing members. The framing members are preferably made of lightweight metal channel, but other materials may alternatively be employed. While the illustrated framing members are right-angle channel, other cross-sectional shapes also having divergent cross-sectional legs oriented at right-angles to one another may be employed. For example, T-shaped framing members of the shape disclosed in the Applicant's aforementioned patent may alternatively be used. However, right-angle channel reduces the material cost and weight of the framing member, and has the advantage that right-angle channel is readily and affordably available in the marketplace. As another alternative, closed rectangular channel members could be used, in which case adjacent sides of the channel form perpendicularly diverging legs of its cross-sectional shape for respective mating with the supports and drywall, but again, right-angle channel may be preferred in the interest of material efficiency.

FIGS. **9** and **10** illustrate an unslotted support **32'** featuring a single-wall fastening portion **42'**. As shown in FIG. **9**, this support **32'** features a through-hole **64** in the fastening portion **42'** near the stop flange **40**. Turning to FIG. **10**, the through-hole **64** enables routing of electrical wiring **66** or other lines (e.g. speaker wire; or copper pipe, PEX tubing or other small plumbing conduits) through the air gap G behind the framing members **34**, i.e. between the framing members **34** and the insulation panels **12**. As shown, this enables an electrical line to run from one side of a framing member to another via the through-hole **64**, for example to reach an electrical box (e.g. light switch, outlet or junction box) **68** mounted in the wall cavity between two adjacent framing members **34**. The drawing illustrates one such example, in which the electrical box is fastened to the fastening leg of a respective framing member on the free side thereof facing away from the single-walled fastening portion **42'** of the respective support **32'**. It will be appreciated that the slotted support **32** of FIG. **4** may likewise be provided with a through-hole **64** opening through both walls of its fastening portion **42** for routing of electrical wiring or other lines through the support behind the respective framing member. The use of a pre-defined through hole in each support enables easy routing of utilities or the like without having do drill, cut, punch or otherwise create holes in the framing members, which also serves to better retain the structural integrity of the framing members.

Although disclosed in the context of a concrete insulating wall assembly, the invention may be employed in various applications to provide insulation capacity in various types of buildings, including concrete, steel, post frame, animal confinement, and quonset and tarp buildings, for example. Although the illustrated embodiment employs vertically oriented slots and framing members lying cross-wise to the top and bottom edges of the insulation panels, other embodiments may employ other orientations, while still providing a suitable framework for attachment of drywall or other finishing materials, such as horizontal slots and framing members spanning between the opposing upright side edges of the panels, or obliquely angled slots and framing members. However, vertically upright orientation of the framing members is preferred, at least partly due to the self-plumbing functionality achievable by hanging of such upright framing members from an upper framing connector.

The spacing between the slots **28**, and the resulting spacing between the installed sets of clips and installed framing members may be varied. For example, insulation panels with predefined slots or pre-embedded support clips may employ known wall stud spacing values such as 16-inch or 24-inch, or for example employ 8-inch slot spacing from which the installer can choose to insert the sets of clips at 16-inch or 24-inch intervals according the regional standards or particular job requirements. The insulation panels may vary in size, and accordingly the number of slots or clip sets per panel may accordingly vary.

With reference to FIG. **2**, in preferred embodiments, upper and lower foam gaskets **60**, **62** are preferably employed between the top edges of the insulation panels **12** and the overhead ceiling or floor joists **50**, and between the bottom edges of the insulation panels **12** and the underlying floor, which reduce the effects of floor heaving. The width dimension of each gasket **60**, **62**, measured perpendicularly from the interior surface of the foundation wall **100** exceeds the combined thickness of the insulation panels **12** and the air gap G measured in this same direction. As a result, the upper and lower framing connectors **48**, **56** are fastened to the joists **50** and floor through the upper and lower gaskets **60**, **62**, respectively, and the top and bottom of the air gap G are sealed off by the gaskets. The gaskets preferably have the same reflective coating as the insulation panels. The gaskets reduce convection flow in the air cavity, which in conjunction with the reflective surfaces, enhances the overall effective R-value significantly.

Although the illustrated embodiment is described as a concrete insulation system installed on the interior of a concrete wall, the insulating wall assembly may be installed in other contexts, regardless of the presence of a concrete wall. In one embodiment, where the insulation panels do not internally line a concrete wall or other structure, the insulation panels may be installed with the slotted-faces of the insulation panels facing outwardly away from the interior space of the building toward the exterior environment. This way, the installation of the framing member support clips and associated framing members on the exterior side of the insulation panels can be used to form a rainscreen, where the slotted exterior face (preferably coated in the manner described herein above) forms a drainage plane, and the support clips and installed framing members create an airspace between the drainage plane and one or more exterior finishing layers mounted on the framing members. Accordingly, the slotted first faces of the insulation panels may face into the interior space of the building, as in the illustrated embodiment, or may face away from the interior space of the building in other embodiments. Likewise, the wall finishing panels may be interior finishing panels such as drywall, or exterior panels such as exterior sheathing onto which additional exterior finishing layers (e.g. siding) can be mounted. Alternatively, wall finishing panels for exterior applications may be the actual finishing layer material itself, it if is suitable for mounting directly to the framing members without an underlying layer of sheathing material.

Since various modifications can be made in my invention as herein above described, and many apparently widely

different embodiments of same made within the scope of the claims without departure from such scope, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.

The invention claimed is:

1. An insulating wall system comprising:

a plurality of insulation panels each having interior first face for facing a first direction relative to an interior space of a building, an opposing second face for facing an opposite second direction relative to said interior space of the building, and at least one slot recessed into the body of insulation from the first face thereof and running longitudinally between a pair of opposing perimeter edges of said body of insulation, said slot having a slot length measured longitudinally between said pair of opposing perimeter edges;

a plurality of supports each having an insertion portion insertable into the slot of each insulation panel and a fastening portion arranged to project outwardly from the first face of said insulation panel with the insertion portion received in the slot of said insulation panel, whereby a series of framing members are fastenable to the fastening portions of the supports to define a framework on which wall finishing panels are mountable over the insulation panels at a spaced distance from the first face thereof; and

a plurality of framing members defined separately of the plurality of supports for subsequent fastening thereto during assembly;

wherein a longitudinal dimension of each support is multiple times shorter than said slot length and is arranged to lie parallel to the slot length when inserted in the slot, and a longitudinal dimension of each framing member is multiple times longer than longitudinal dimension of each support, whereby multiple supports are receivable in the slot at spaced apart locations along the slot length to receive fastening of a singular one of said framing members to said multiple supports at said spaced apart locations along the slot length.

2. An insulating wall system comprising:

a layer of insulating panels placed against a wall of a building and comprising:

a first face facing a first direction relative to interior space of the building;

an opposing second face facing an opposite second direction relative to said interior space of the building; and

a pair of opposing perimeter edges separated from one another in a longitudinal direction by a length dimension;

a set of supports each having one end anchored within the insulation panel and having a fastening portion projecting from the first face of the layer of insulation panels;

a framing member defined separately of the set of supports for subsequent fastening thereto during assembly;

wherein a longitudinal dimension of each support lies parallel to the longitudinal direction in which the opposing perimeter edges of the insulating panel are separated, said longitudinal dimension of each support is multiple times shorter than said length dimension of said layer of insulating panels, a longitudinal dimension of each framing member is multiple times longer than longitudinal dimension of each support, and the set of supports reside at spaced apart locations along the length dimension of the layer of insulating panels, whereby the framing member is fastenable to said set of supports at the spaced apart locations along the length dimension of the insulating panel.

3. The insulating wall system of claim **1** wherein the framing member has a cross-sectional shape in planes normal to said longitudinal dimension of the framing member, said cross-sectional shape comprising a pair of diverging legs, including a fastening leg for fastening to the fastening portions of the supports in face-to-face relationship therewith, and a supporting leg carried by the fastening leg in a position lying cross-wise to the fastening portion so as to face away from the insulation panels to present a surface for fastening of the wall-finishing panels to the supporting legs of said plurality of framing members at a distance from the insulation panels.

4. The insulating wall system of claim **1** further comprising spray foam insulation sprayable into the slots of the insulation panels to secure the insertion portions of the supports within said slots.

5. The insulating wall system of claim **1** wherein the insertion portion of each support is barbed to resist withdrawal of said insertion portion from the slot in the insulation panels.

6. The insulating wall system of claim **1** wherein each support comprises a positioning portion lying cross-wise to the insertion and fastening portions where said insertion and fastening portions join together, whereby abutment of said positioning portions of the supports against the first faces of the insulation panels denotes fully inserted positions of the supports within the slots of said insulation panels.

7. The insulating wall system of claim **1** wherein each support has a pre-defined through-hole in the fastening portion thereof for routing of one or more lines therethrough in an assembled wall featuring said supports.

8. The insulating wall system of claim **2** wherein:

at each one of a plurality of spaced apart locations along the layer of insulation panels, a respective set of supports project from the first faces of the insulation panels at spaced apart positions along a linear path running between the pair of opposing perimeter edges of one of said insulation panels; and

a respective framing member is fastened to each set of supports with the longitudinal dimension of said framing member running along the linear path of said set of supports, and each framing member, in planes normal to said longitudinal dimension thereof, has a cross-sectional shape with a pair of diverging legs, a first one of said diverging legs being fastened face-to-face with the respective set of supports at the fastening portions thereof, and a second one of said diverging legs lying cross-wise to the first leg and facing away from the insulation panels to present a surface for fastening of the wall-finishing panel to said second one of the diverging legs.

9. The insulating wall system of claim **8** wherein each linear path runs longitudinally between opposing upper and lower perimeter edges of the layer of insulation panels.

10. The insulating wall system of claim **3** claim wherein each framing member is a right-angle channel.

11. The insulating wall system of claim **8** wherein the wall assembly further comprises a lower framing connector that is fastened atop a floor surface and resides at a distance from the layer of insulation panels on a side thereof faced by the first face, the lower framing connector extending along the layer of insulation panels and the framing members being fastened to the lower framing connector in positions standing upright therefrom.

12. The insulating wall system of claim 11 wherein the lower framing connector comprises a right angle channel member with one cross-sectional leg that is fastened to the floor surface, and another cross-sectional leg standing upright from the floor surface and having the framing members fastened thereto.

13. A method of assembling an insulating wall assembly, the method comprising:

placing a layer of insulation panels against a wall with a first face of said layer facing away from said wall into an interior space of a building, an opposing second face of said layer facing toward said wall in an opposite second direction relative to said interior space of the building, and with opposing perimeter edges of said layer of insulation panels separated from one another in a longitudinal direction by a length dimension;

providing a set of supports each having a longitudinal dimension multiples times shorter than said length dimension of the layer of insulation panels;

anchoring the set of supports in the layer of insulation panels such that the longitudinal dimension of each support lies in the longitudinal direction of the layer of insulation panels, the set of supports are spaced apart from one another along the length dimension of the layer of insulation panels, one end of each support is anchored within the layer of insulation panels and a fastening portion of each support extends outwardly away from the first face of the layer of insulation panels; and

with the set of supports already anchored in the insulation layer, fastening a singular framing member to the set of supports so that the singular framing member is carried at a spaced distance from the layer of insulation panels and is respectively supported by the set of support members at the spaced apart positions along the length dimension of the layer of insulation panels.

14. The method of claim 13 wherein the step of anchoring each support comprises inserting the one end of each support into a slot that is recessed into the layer of insulation panels at the first face thereof, said slot running longitudinally between the opposing perimeter edges of said layer of insulation panels.

15. The method of claim 14 wherein the step of anchoring each support further comprises applying spray foam into the slot to embed the one end of the support within said spray foam, which sets in place within the slot to anchor the support to the insulation panel.

16. The method of claim 13 comprising (i) fastening a lower framing connector to a floor surface at a distance from the layer of insulation panels on a side thereof faced by the first face such that the lower framing connector extends along the layer of insulation panels; and (ii) fastening a free-hanging lower end of the framing member to the lower framing connector.

17. The method of claim 16 wherein the lower framing connector comprises a right angle channel, and the method comprises fastening a first cross-sectional leg of the right angle channel to the floor surface to place a second cross-sectional leg of the right angle channel in a position standing upright therefrom, and fastening the framing member to the second cross-sectional leg of the right angle channel.

18. The system of claim 1 wherein the framing members are metal and the supports are plastic.

19. The system of claim 2 wherein the framing members are metal and the supports are plastic.

20. The method of claim 13 wherein the framing member is metal and the supports are plastic.

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